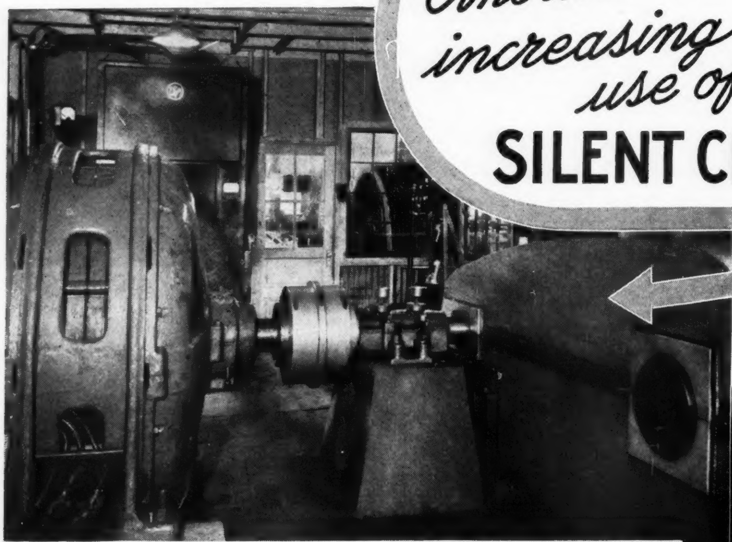
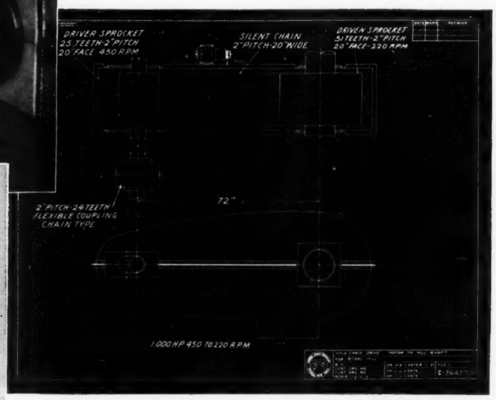
The CORNELL ENGINEER

Another Example of the increasing use of MORSE SILENT CHAIN DRIVES





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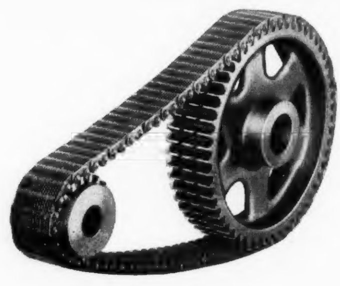

The installation shown in the photograph above left shows a Morse Silent Chain, 2" pitch, 20" wide, in its housing. This drive transmits 1000 h. p., with 100% peak overload, from motor to rolling mill. The blueprint drawing above shows details . . . Also shown in photo and blueprint is a Morse Flexible Chain Coupling, enclosed in split aluminum cover.

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EDITORIALS

Cornell Society of Engineers

We would like to take this opportunity to congratulate the new officers of the Society on their election. The retiring officers did a splendid job of extending the activities and membership of the Society, and the newly elected men have a real standard to maintain. We are sure that working with them for the coming year will be as great a pleasure as it has been to work with the retiring officers.

Introductory Membership

Now that graduation is in the offing, the Seniors of the Engineering College will have an opportunity to join the Society, which now numbers 930. Its advantages, which include association with fellow alumni and contact with Cornell through the pages of the ENGINEER, hardly need to be pointed out. A special introductory offer of only one dollar is extended to members of the class of '39. This offer covers a year's full membership in the Society and a subscription to the ENGINEER. Applications should be sent to Mr. Paul Reyneau, 107 East 43rd Street, New York City.

Cornell Day

Congratulations seem to be the order of the day, and among the most deserving is "Bonny" Campbell and his Cornell Day Committee. The Engineering show was better than ever this year, and should truly have made the sub-frosh feel like "Engineers for a day."

Not satisfied to leave the job as it stands, Campbell and his committee have gone ahead with a plan for the future organization of the students of the College of Engineering so that a more coordinated show will result in the future. A plan was presented before the students at a meeting on Monday, May 22, for the formation of a permanent organization to be known as the Executive Committee of the College of Engineering. Headed by a senior as President, the council is to consist of fifteen members, ten of whom shall be students, four faculty members, and a representative of the Dean. The ten students shall be the President, one senior and one junior from each of the four engineering schools, and a representative of the CORNELL ENGINEER.

The committee is not only intended to run next year's Engineering Show, but also to direct and coordinate other student activities. As we go to press too early to report on the meeting, we cannot say whether or not the plan will be adopted, but we would like to express our whole-hearted support to the plan. The finished form in which the idea has been presented shows that a great deal of planning and forethought has gone into it, and we feel that such a committee would have a very real function.

The CORNELL ENGINEER

for MAY, 1939

VOLUME 4 NUMBER 8

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Model railroad exhibited at Engineering Show on Cornell Day

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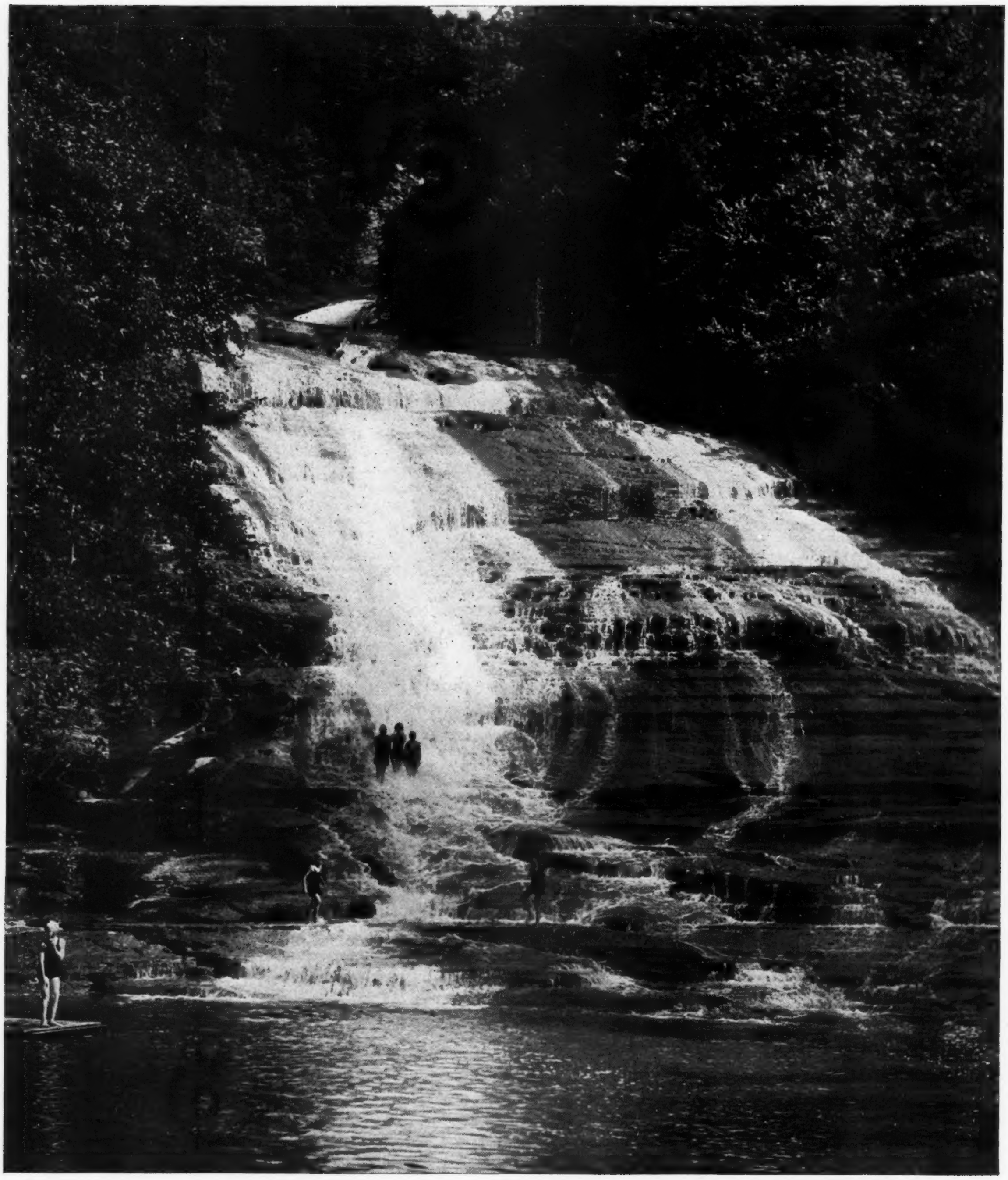
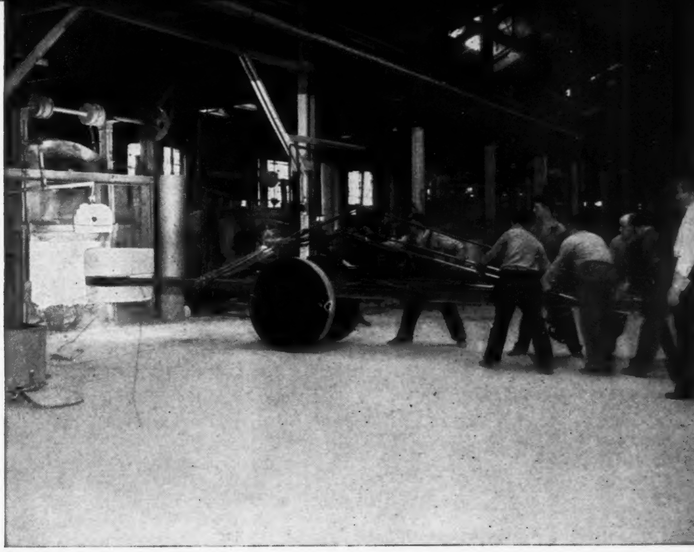


BUTTERMILK FALLS, ONE OF THE MANY
SCENIC ATTRACTIONS NEAR THE CAMPUS

Manufacture of Optical Glass



—*Courtesy of Bausch & Lomb*
Pot of Glass Being Removed from Furnace

By Thomas M. Wilson, E.E. '42

The making of an optical glass lens, of even a very small lens, is a long and complicated process. Long hours, sometimes days, of cooling the glass, lengthy annealing processes, and the high exactness required make the engineering of manufacturing an optical lens a very delicate task. Since the lens is used so extensively by engineers, a description of the manufacturing process involved might be of considerable interest to engineers and such is the purpose of this article.

The quality of a lens is dependent upon several factors. The most important characteristic of any kind of a glass lens is refractive index, which is the ratio of the velocity of light in air to the velocity in the medium which in this case is the glass. The entire science of optics depends upon this law of refraction. Since the refractive index is slightly different for different colors, a standard which is used as the refractive index, was established. So the mean refractive index was taken as the refractive index of the Sodium D line of the spectrum. However, it would be very difficult to measure the speed of light in air and in the medium so an easier method of finding the refractive index has been devised. It is always worked out by the relation known as Snell's Law which gives this relation:

$$\frac{\text{sine i}}{\text{sine r}} = \frac{\text{refractive index of glass}}{\text{refractive index of air}}$$

where i is angle of incidence and r the angle of refraction. The spectrometer is usually used to make accurate measurements of the refractive index.

There are some defects of a lens which can be eliminated through careful manufacture. The lens must be striae free, strain free, and free from bubbles. These are physical properties which are sometimes sacrificed for the sake of exceptionally high refractive and dispersive properties. Of course, the transparency of a lens is a very important factor as is the durability.

Now let us turn to the actual process of manufacturing an optical lens. This process includes four steps before a point is reached where the optical glass can be separated from spectacle glass. These four steps are: (1) pot-making, (2) pre-heating, (3) charging, and (4) melting.

The first step is, of course, to make the mold for the glass, and all lenses are made from molds. These molds are in the form of pots. These pots have to be made very carefully, because if there are any defects in the pot, the glass made from the pot will also be defective. The pots are made of clay and must be iron-free. Iron is the particular enemy of glass that manufacturers have to watch. Before being put into use the pots must age for a considerable length of time, depending on the type of work they are to be used for. The usual duration of the aging period is 6 months to a year.

Next is the pre-heating process. The raw glass has to be pre-heated in a gas fired furnace to remove the impurities. Then the raw glass is charged. This charging process determines whether the glass will be crown glass or flint glass and just what index of refraction the glass will have. It is a chemical process and is very precise since a slight variation in the constituents of the charge will change the index of refraction a great deal.

It is interesting to note here how the art of manufacturing glass has developed. For many years, only the ordinary crown and flint glasses were available. Optical glass of the "newer" type is characterized by a much wider variety of chemical constituents which go to make up the charge, the more important being

—*Courtesy of Bausch & Lomb*
Pot-Making

the oxides of barium, boron, magnesium, aluminum, and zinc. Glasses can be produced by aid of these in which purity of color, chemical stability, and freedom from defects are equal to the best of the ordinary crown and flint glasses. Thus the charging process has become a very precise practice due to the wider variety of types of glass that have to be manufactured. The Bausch and Lomb Optical Company of Rochester make glass from the borosilicate crown with an index of 1.51100 to extra dense flint with an index of 1.72000. This includes all types of glass in common manufacture. There are other types used experimentally with an index as high as 1.92000. The charging process, as one can easily see, is a very important part in the manufacture of the lens.

The glass then has to be melted (not really melted but heated to a plastic state). It is at this point that the optical glass requires a different process from the spectacle glass. The difference in the use of optical and spectacle glass is: the optical glass is used for prisms in microscopes, telescopes, field glasses, etc., while the spectacle glass is used in eye glasses and for small lenses. In order to discover the difference in the manufacturing of optical and spectacle glass, I will have to describe both procedures.

We will first take up the process for spectacle glass. As soon as the pot comes out of the electric furnace (at a temperature of 1100° Fahrenheit) the glass is poured onto a table and rolled to a thickness of approximately ⅝″ for most ordinary lenses. It is then passed under lehrs which cool the sheet gradually so that the whole cooling process requires about 24 hours. The sheet is next thoroughly annealed. Since the sheet is not perfectly rectangular in shape after it is rolled, it has to be cut into the shape of a rectangle. The sheet is divided into small squares by diamond cutters and weighed. The glass is melted and an air press presses the glass into the approximate curve desired for the lens when it is completed. This allows the grinding operations to remove only a minimum of glass. The grinding operations then shape the lens to the desired shape. Of all the operations on a lens the grinding operations must be done with the greatest of care. The curves of glass first have to be blocked and covered with pitch. Then using various roughnesses of abrasive materials the lenses are ground to the right size. Then all abrasive materials and the pitch must be washed off. Of course, it is much more difficult to grind the second side of the lens because the side that has already been ground must not be scratched. After the grinding operations are completed, all the lenses are inspected for scratches and other defects. This is the process for making a spectacle lens.

The process for optical glass is quite different from the process just described. Whereas the spectacle glass was cooled by lehrs in about 24 hours, the optical glass is cooled in the pot for several days depending on the size of the lens or prism desired. The cooling must be done more slowly because there must be no visible layers of cooling as there would be if the glass was cooled in a short period. The reason for this is that the prism is looked through from the side or several sides while the lens is never viewed from the side, so the layers of cooling do not show up. As the cooling takes place, the glass invariably breaks up into large hunks of glass which are picked out of the pots. Only the hunks which are perfect are used and these are cut into the largest rectangular blocks with the minimum

(*Continued on page* 22)

—*Courtesy of Bausch & Lomb*
A Group of Prisms

He Brought Democracy to Industry

John R. Bangs, Jr.,

By Prof. John R. Bangs, Jr., M.E. '21

Back in 1924, a young Cornellian became interested in the motion picture camera. Filming the undergraduate and alumnus to him became a fascinating adventure. When the reunioning classes met in June, he photographed their antics. Then he flew the films to Eastman in Rochester, had them developed, and brought them back in time for the class banquets the next day.

An engineer by training, this young Cornellian, Allan H. Mogensen, soon became impressed by the tremendous possibilities for the use of motion pictures in the elimination of wasted time and effort in industry. By 1930 he had acquired the necessary experience to carry out his ideas. By 1937 he had become so successful in their application that he was awarded the Gilbreth Medal for his distinguished contribution to management.

Mogensen has given management a new approach to an old problem. His Cornell professor taught him the principles of scientific management as they had been developed by Taylor and Gilbreth. Mogensen streamlined these principles by using the modern motion picture camera and combined with them a psychological approach that struck right at the roots of industrial problems. Then he sold his methods to industry as "Work Simplification." The professors were surprised; industry and Mogensen reaped the profits.

"Just what is there to Mogensen's method?" I recently asked the editor of a leading industrial magazine. "He has a combination of economics and psychology that really works," was the reply. "He gets every last worker in a plant to work toward the improvement of method and the reduction of waste. The fact that so many workers eagerly participate in this work has caused a leading engineer to say that Mogensen has brought *democracy to industry*."

Mogensen saw from the beginning that the management expert called in by a company as a consultant was at an immediate disadvantage. The foreman and the workers resented his very presence. Mogensen knew that it was human nature to resent criticism and to deprecate the ability of an outsider to understand one's own problems. He further appreciated that most people resist new ideas because they are new and unfamiliar.

Reasoning thus, he reversed the process. The consultant, under the new approach, instead of making or suggesting changes and improvements himself, teaches the foreman and workers to make them. He merely instructs the foremen and workers in a technique, and points out some of the things done in other plants. In this way he enlists the co-operation of every single employee in an organization in cost cutting and waste elimination.

The foreman is the key man in establishing a "work simplification" program within a plant. He is naturally the raw material for the future department head and executive. He is the one who must train new employees, and retrain the old ones when

ALLAN H. MORGENSON

new methods are instituted. The first step in the program is, then, the selection of those foremen who are to participate in the preliminary training. Groups are usually composed of men of similar rank, as it has been found that people will feel freer to speak openly if they are with others holding substantially the same position in the organization.

Secondly, the objective of the programs must be thoroughly established. This is usually stated: "To make a better product, at a lower cost, and at the right time." No one will deny that the ideal system in any country is high wages and low prices. We know that this, in turn, creates a high standard of living; but it can be achieved only through *increased productivity of labor.*

When the objective of the program has been thoroughly established, the next step is to stimulate the interest of the foremen. This it has been found can be done best by showing motion picture films on lines of work other than that engaged in by the groups. If pictures are shown on operations performed in some other company, those taking the course have an opportunity to laugh at the other fellow's mistakes. They wonder how anyone could do things as awkwardly as shown in the picture. Then when they see the method improved by simplification, they agree that it is the logical solution.

Finally, when these foremen return to their own departments and look around, they soon find that they are doing many things just as foolish as those shown on the film. Their eyes have been opened to see waste movements and absurd methods. Soon they begin to make suggestions and effect improvements of their own. When improvements are made and pictures of the old and new methods taken and projected for the group, all of the foremen are further inspired by the fact that *this betterment was effected by one of their group.* Titles for the films which include the suggester's name help. Further improvements are often immediately suggested, and progress is rapid. Thus much of the success of these programs depends on the presentation of these "before and after" illustrations.

Apropos of this point is a recent article by a leading labor leader which says:

> "One feature of motion and time study as it is usually conducted is regarded as unsound by organized labor and socially minded persons outside the labor movement, including some industrial engineers of my acquaintance. This objection is directed more toward the manner in which time study is usually used than against time study itself. In a large number of cases, no provision has been made for encouraging the worker to think about his own job and suggest ways in which it might be improved. This function has been transferred to a time-study observer or a planning office, the function of the worker being dehumanized to a mere following of instructions as they come from either of these sources. Unions believe that this implication in the customary use of time study is unsound, and that the worker, who is a human being, should be given every opportunity to bring all his faculties to bear upon his work and, to the limit of his intelligence and skill, participate in developing his own job."

THE "WHY" QUESTIONNAIRE

One of the features of the Mogensen program is the "why" questionnaire which offers every employee in the organization an opportunity to ask about some procedure that is part of the daily job. Each worker is asked to submit to his foreman or department head at least one of these "why" questions. The "why" question approach rather than a definite suggestion approach for improvement is used because it has been found difficult to induce workers to make suggestions until they have had some experience with the program.

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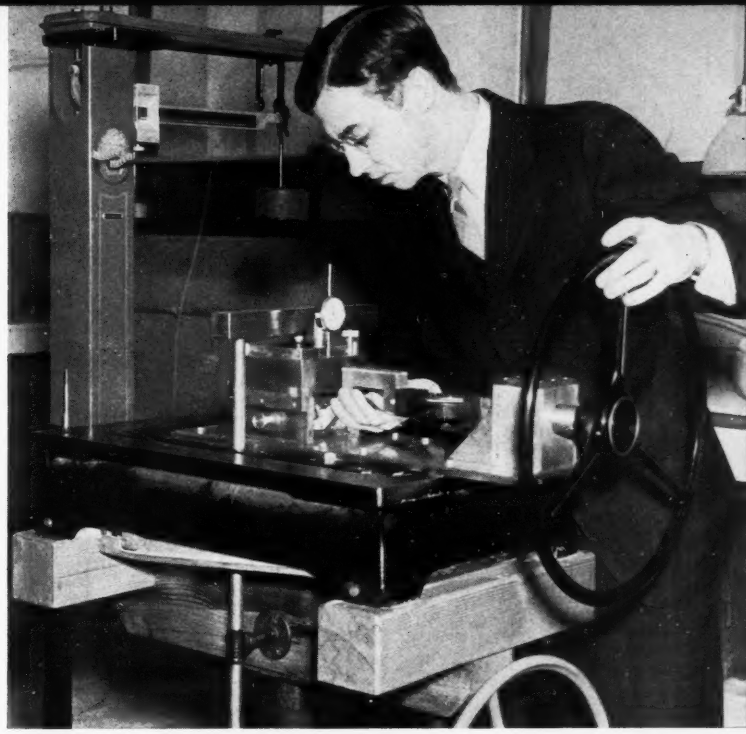
NEW SHEAR MACHINE
FOR TESTING SOILS


Professor Jenkins Operating Machine

By PROF. HERBERT T. JENKINS

An improved device for testing soils in shear, developed in the soil mechanics laboratory of the School of Civil Engineering, makes possible greater accuracy in analyzing the behavior of various kinds of soil. It is of vital importance to engineers to know with precision under what pressure and at what moisture content soils will slip, especially when used for highway foundation and earth dams. The machine will be used for undergraduate instruction and graduate research, and will be available to U. S. Army Engineers, who, in their regional flood control headquarters on the Cornell Campus, are planning a number of earth dams for the upper reaches of several rivers in northern Pennsylvania and southern New York.

The new apparatus is of the constant strain type, and eliminates some of the unsatisfactory features of previous assemblies. It is adapted either to remolded or to undistributed samples, and may be used with the sample submerged in water or not, as desired. Simplicity, ruggedness, and reliability are qualities of the machine.

The machine consists of the following major elements:

A 1000 lb. Fairbanks scale mounted securely on a wood and steel frame, for measuring the normal load to be applied to the soil sample.

A screw jack inverted under the scale, for applying the normal load to the shear device through a steel yoke. This yoke applies the load in a downward direction to a steel ball centered on the upper block of the device in order to induce uniform vertical loading. Vertical movement is further insured by a large guide tightly screwed to the base with thumb-screws.

The shearing device itself consists of a lower block, top surface 4 inches square, riding on four small ball bearing wheels between two vertical side guides. The upper guide is screwed to these sides of the base, and prevents any horizontal movement of the upper block. The base is held on the platform of the scale by four small bolts.

The horizontal loading screw and measuring ring applies the shearing load at the shearing plane, and causes the lower block to move forward at a constant rate of speed, or at a constant rate of strain. The load, however, increases (up to the point of failure) as the strain increases, and a proving ring is used to measure the variation. This ring consists of a calibrated circular steel band which distorts when load is applied to it diametrically. The amount of distortion is measured by a one-ten thousandth inch gauge placed inside of the ring, and the readings of the gauge are converted to load in pounds. Accuracy in determining this load is obtained by using the ten-thousandth inch gauge for measuring very slight deflections of the steel proving ring.

Similar gauges are placed in the device for measuring the vertical movement of the upper block and the horizontal movement of the lower block. These readings are useful in checking the validity and accuracy of the work.

(*Continued on page* 22)

CHARLES M. MANLY

PIONEER AERONAUTICAL ENGINEER

Material for this article was obtained largely from an article in the Society of Automotive Engineers Journal, April, 1939. By C. B. Veal, entitled " Manly the Engineer."

By ROBERT T. CLARK, C.E. '41

During the days of the Spanish-American War, the U. S. War Department requested Dr. S. P. Langley to undertake the development, construction, and testing of a "flying machine" capable of carrying a man. An appropriation of $50,000 was made. But Dr. Langley needed more than financial aid; he needed an assistant—a brilliant, capable, tireless engineer—who could develop an airplane engine. In his search for such a man, he asked Professor R. H. Thurston, Dean of the School of Engineering at Cornell in those days, to recommend the best young engineer he knew. From the engineering class of 1898, Dean Thurston selected Charles Matthew Manly.

Twenty-two years old at the time of this appointment, young Manly had been fired with a zeal to become an engineer by a Cornell graduate who was in charge of an electrical plant at Greenville, South Carolina. In order to overcome a deficiency in mathematics, he studiously applied himself to the subject; at his entrance to Cornell in 1895 as a sophomore, Manly was said to have had the best preparation in mathematics ever brought to the University. Specializing in both electrical and mechanical engineering, he was among the early experimenters in the transmission of currents at high voltage. Once, when he was preparing his thesis on his investigations, he narrowly escaped death by coming in contact with a current so strong that it threw him across the room. By working in the shops during the summer months, he completed his engineering course in three years and acquired the surpassing mechanical skill which became extremely valuable in his aeronautical work.

Upon becoming affiliated with Dr. Langley as his chief assistant, the Cornell graduate eagerly embarked upon seven years of pioneering in aeronautical engineering. His work included: the design and construction of an airplane motor; experiments with Langley models to obtain data for use in balancing the large flying machine and in constructing a launching apparatus; the flight tests of the man-carrying machine. By the middle of 1903 the machine (which was destined to be dubbed "Langley's Folly") had been completed. On October 7, 1903, the first of two trial flights was unsuccessful.

Two months later a second trial flight turned out equally unsuccessful; not only was it unsuccessful—it almost ended fatally for Test Pilot Manly. On this occasion, the launching apparatus had been set in motion, the propellors were revolving rapidly, and the engine seemed to be working perfectly. Suddenly a crashing, rending sound, followed by the collapse of the rear wings, showed that the machine had been wrecked. Deprived of its support in the rear, the airplane reared up in front under the action of the motor, assumed a vertical position, and finally toppled into the icy waters of the Potomac River.

Unfortunately, Manly's cork jacket became entangled in the wreckage. With a supreme effort, he ripped the jacket in two, dived, and swam under water until he had cleared the wrecked plane. But when he attempted to reach the surface, his head struck a block of ice. Again he dived and swam clear of this new obstruction. He was under water for a minute and a half.

Exhausted and his head bleeding freely, he emerged from the Potomac into a storm of newspaper ridicule and Congressional criticism. "Langley's Folly", "Criminal Waste of the People's Money" were some of the less blatant press notices. The original appropriation

(*Continued on page* 26)

C. F. Hirshfeld

DISTINGUISHED ENGINEER AND EDUCATOR

By S. R. Irish Jr., M.E. '41

The profession of engineering lost one of its most distinguished members on April 19, when Dr. C. F. Hirshfeld, internationally known consultant and former member of the faculty of the College of Engineering at Cornell, died in Detroit at the age of 58. His survivors include his wife, the former Elizabeth Winslow '01, and two sons, Dr. John W. Hirshfeld '30, of New Haven, Connecticut, and James F. Hirshfeld '34, of Detroit.

Distinguished in many fields, Dr. Hirshfeld carried on research and consulting practice in several branches of engineering, served during the war as a Lt. Colonel in the U. S. Ordnance Department, and wrote many books and papers on engineering subjects.

In paying tribute to Dr. Hirshfeld, Dean Hollister said: "With the passing of Dr. C. F. Hirshfeld the College of Engineering mourns the loss of a most distinguished graduate and former faculty member. Through his teaching and writing he rose to an authoritative position in the field of power engineering. Since leaving Cornell he has distinguished himself in important research developments in the power field. He has played a leading part in many learned societies in the advancement of his profession. His memory will be cherished and his loss will be keenly felt among the many organizations that have profited by his counsel and among the host of friends both in this country and abroad."

Born in San Francisco on January 30, 1881, Dr. Hirshfeld graduated from the University of California in 1902, with the degree of Bachelor of Science in Electrical Engineering. In 1902 he became a student, and in 1904, an instructor at Cornell, receiving in 1905 the degree of Master of Mechanical Engineering. He remained a member of the faculty until 1914, advancing to the position of Professor of Power Engineering. During this period he was author and coauthor of several text books on steam power and internal combustion engines which are still classics in their field. In addition to his academic duties, he carried on an extensive consulting practice.

In 1913 he became Chief of Research for the Detroit Edison Co. and organized the first research department to be maintained by an electricity supply company. Dr. Hirshfeld directed research in many fields, including steam-electric power plants, industrial electrical heating, modernized street railway equipment, and many others.

Many honors have come to him in recognition of his accomplishments. Included are honorary degrees of Doctor of Engineering from Rensselaer Polytechnic Institute and the University of Detroit, the 1934 prize of the American Institute of Electrical Engineering for the best paper on public relations and education, and the Worchester Reed Warner Medal for 1937 from the American Society of Mechanical Engineers.

Always a great humanitarian, Dr. Hirshfeld had a deep interest in the welfare of young men with whom he always closely associated himself. The loss of his influence will be keenly felt.

Do You Know These Men?

WILLIAM HARRY JOHNS '39, A.E.

To us of the ENGINEER, Harry Johns is known as our erstwhile editor-in-chief. Others around the campus may know him as Cornell's top high jumper. Besides this he has earned a good portion of his way through college through tutoring in school and work during summer vacations.

Harry especially prizes the experience he has gained during his summer vacations. It includes working in two aeronautical drafting rooms and in a metropolitan bank.

Harry's preparatory training was rather irregular inasmuch as he divided his three years in high school among as many different schools. In spite of this he was elected president of his class in high school.

While at Cornell Harry has become interested in flying, and he would like to take it up more seriously when and if he gets the time.

When asked what he intended to do after leaving Cornell, Harry replied that during his college years his interests have developed along less technical lines than he had originally expected, and he feels that his abilities lie in the non-technical fields.

(*Continued on page* 16)

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THOMAS L. SNOWDON '39, E.E.

Remember the fluorescent demonstration in Franklin Hall this Cornell Day? It was Tom's particular job to lecture to the spectators and show the startling effects of ultra-violet light upon common objects. Thus a harmless-looking wolf's head of which the teeth had been treated with fluorescent paint revealed a vicious beast under ultra-violet rays.

Tom also assisted in the installation of the amplifier which boomed announcements and request numbers out over the quadrangle. Last year he was in charge of the beam casting exhibit and modestly admitted that he blew out three or four of Professor Ballard's "pet" tubes before the machine was in proper working order.

As one may have surmised, Tom is deeply interested in experimental work and spends most of his spare time building receivers or monkeying with automobiles and outboard motors. When he finds time for sports, he's usually swimming, playing tennis or baseball.

(*Continued on page* 16)

ALBERT TRUMAN MAYLE, JR. '39, E.E.

"Bud" Mayle believes that one should get the most out of his college life, and he has certainly put this into practice. This year he not only was chairman of the Exhibits Assignment Committee for the Engineering Show but also constructed a radio-controlled model railroad. His most active hobby is "ham" radio although he spends a great deal of his time swimming, skating, and playing tennis.

His keen interest in radio started back in his high school days. In his last year he built the Niagara Falls Police radio transmitter and later operated it. He has kept up this hobby through his college days, and after graduation hopes to do research work in television.

"Bud" has learned a great deal from college, but his comment on his college life is; "It's a great life if you didn't have so many Mech Labs". He liked the course in Broadcast Engineering the best of all his courses. His advice to engineering students is: "Don't let your marks get down too low, but take at least one night a week to enjoy yourself." He believes that the friendships and

(*Continued on page* 16)

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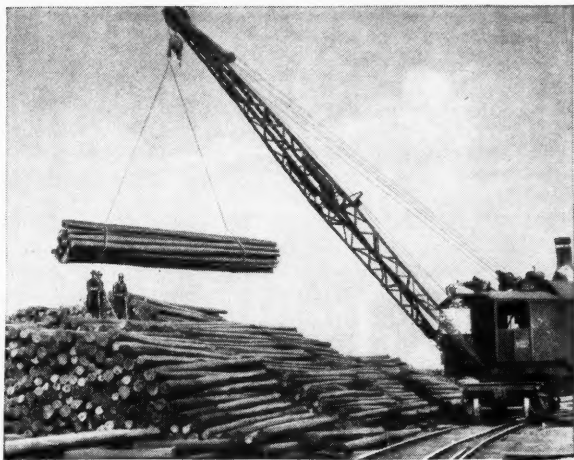
JOHN GEORGE TAMMEN '39,C.E.

"I'm certainly glad spring is here" said Jack Tammen while looking out of his study window. Known better to his friends as "J.G.", he is about the tallest man in the C.E. school for he extends upward six feet, four inches.

Jack lives in Short Hills, New Jersey, and attended East Orange High School. He came to Cornell because of its excellent engineering reputation and because he did not like the atmosphere of a strictly technical school. Here he is taking Civil Engineering with a structural option, his principal interest for years. He has made his mark here as is evidenced by his excellent scholastic standing combined with many extra-curricular activities. He has rowed since his freshman year, being awarded his numerals and varsity letter in the 150 pound crew. In addition to serving on a number of committees, working on the CORNELL ENGINEER board, being Managing Editor this year, he has done outstanding school work as evidenced by his election to Tau Beta Pi.

Besides meeting a lot of people and having a wonderful time for four years, Jack feels that living in a

(*Continued on page* 16)



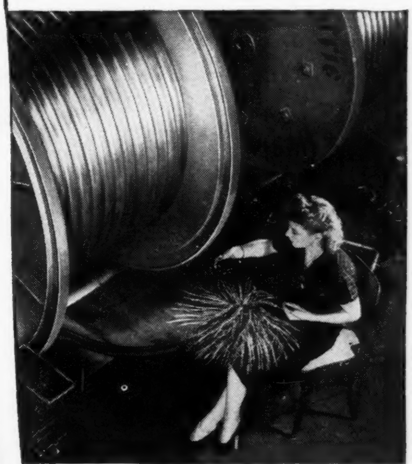
(1) Poles are only one of the hundreds of items which Western Electric supplies.

(2) All materials must pass severe tests. Here an engineer tests a sample of that important little item — rubber tape.

Some things Western Electric does . . . so you can say . . .

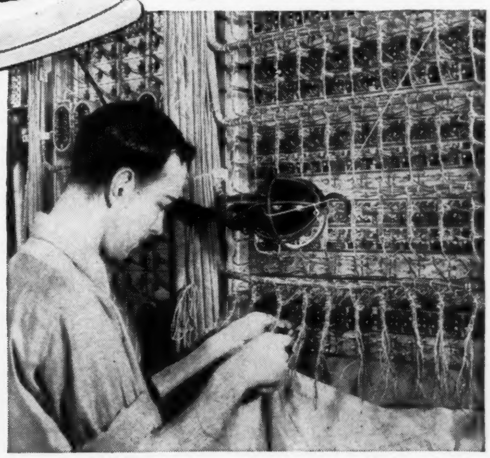
"It's good to hear your voice"

(3) Moulding handles for telephone handsets—one of 248 parts in your Bell telephone.



(4) Each of the three thousand, six hundred thirty-six wires in this cable is given a thorough electrical test.

(5) Twenty-nine distributing houses furnish the Bell Telephone companies with practically everything they require.



(6) And the Company installs the equipment in telephone exchanges.

Western Electric

. . . made your **BELL TELEPHONE**

WITH THE ENGINEERS AT THE

THE ENGINEERING SHOW

After weeks of preparation, the four schools of the College of Engineering opened wide their doors to the general public on May 5 and 6, and showed it the biggest and best Engineering Show yet. Throngs of subfreshman here for Cornell Day streamed through the various exhibits expressing interest in everything, asking questions of student and faculty attendants and guides, turning levers, pushing buttons, and generally speaking, finding out all there was to know about the Engineering College.

The outstanding feature of the entire show was the color organ that was operated in a fountain in front of Sibley. This color organ which incited the most comment of any feature of the show is the first one to operate automatically from a recording.

In the school of Mechanical Engineering the visitors saw numerous interesting and instructive displays. Among these were the new 200,000 pound Universal hydraulic testing machine in the East Mech Lab, a demonstratioon of the photoelastic method of optical stress analysis, and complete equipment for observing the grain structure of metals by intense magnification. As usual the kinematic models of the department of Machine Design were a favorite. These were displayed in the Sibley Library together with the exhibits of the department of Administrative Engineering and the Cornell Engineer. The recently acquired Pratt and Whitney radial aircraft engine was a feature in the West Mechanical Laboratory where practically all the engines and machines were running. Exhibits of the Heat Power department such as the model stoker and octane rating machine, which were located in the Sibley Recreation room, were centers of interest.

The Electrical Engineers again outdid themselves producing a really bang-up show. Perhaps the exhibit attracting the most spectators was the remote controlled electric train. This train was remotely controlled from a little black box with a telephone dial on it and no connection what so ever with the train. Also a popular spot was the beam casting where speech was carried over a light beam. Then there were those who had their personalities rated on the personality meter. Of course the ladies rated high.

The highlight of the Civil Engineering show was the Cornell and Cayuga Railroad with 1200 feet of track, four locomotives, and numerous freight and passenger equipment. This railroad is an accurate scale model with scale of 1 to 48. All the track and equipment were constructed by students who spend many hours on their railroad. The testing machines in the materials laboratory were all operated, the spectators being greatly interested in the results of compression tests conducted on wooden and concrete columns with the 300,000 pound Baldwin-Southark machine. Other exhibits included the soil mechanics laboratory, the Sanitary laboratory where a model sewage treatment plant was shown, and the applied elasticity laboratory where tests were run on transparent models showing stress distribution by means of polarized light effects.

Professor A. W. Brown again gave his well known lecture on liquid air entitled "Adventures at 300 degrees Below Zero." The visitors in the Chemical Engineering Show also saw pilot-plant equipment used for the operations of distillation, evaporation, filtration, grinding, drying and heat transfer.

A.I.E.E. CONVENTION

Eleven students in the School of Electrical Engineering, together with five members of the faculty attended the Northeastern District Meeting of the American Institute of Electrical Engineering at Springfield, Massachusetts on May 3, 4, 5. Bob Roe '39 piloted a group of five to the convention in a special plane, including Asst. Prof. Terry and Bill Lentz '39 of the Cornell contingent.

At the convention, Roe presented a paper on "A Substitute for the Radio Range in Instrument Flight Training" before the Communications and Measurements session of the Student Branches. E. L. Foster '40 spoke on "A Kinetic Power-Time Graph Demonstrator" in the same session. In the Power session Otto Glasser '40 presented "A Study of Automobile Ignition."

Director William F. Lewis Jr. presented a paper with J. E. Hobson of the Westinghouse Electric and Manufacturing Co. on the subject of "Regulating Transformers in Power System Analysis." Professor E. M. Strong, chairman of the Northeastern District Student Branch Committee, was in charge of student sessions and programs. W. W. Cotner represented the Ithaca section at the meeting of the Executive Committee. Other members of the faculty present at the meeting were M. G. Northrup and E. W. Jones.

While at the convention the students had opportunities to visit the plants of Pratt and Whitney Aircraft Corp., and Westinghouse Electric and Manufacturing Co. and also the United States Armory at Springfield.

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FUERTES MEMORIAL PUBLIC SPEAKING CONTEST

In the twenty-sixth annual Fuertes Memorial Contest in public speaking held April 21, Karl John Nelson, Chem. E. '39 was awarded the first prize of $80, Robert Beebe Roe, EE '39 the second prize of $40 and William Newby Freeman, CE '40 the third prize of $20. Seven students representing the colleges of Engineering and Architecture competed.

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C.E. INSPECTION TRIP

Five members of the faculty of the School of Civil Engineering, Cornell University, and approximately 60 students took the annual spring inspection trip which began Sunday, April 23, and ended Wednesday, April 26. All juniors in the school and a number of seniors and graduate students were included in the group, directed by Professors L. C. Urquhart, J. E. Perry, and H. H. Scofield and Drs. T. R. Cuykendall and H. V. Hawkins.

The itinerary included stops at the D. D. and W. Railroad yards in Scranton, Pa., the Montebello Water Tunnel near Baltimore, the Maryland Plant of the Bethlehem Steel Co., the Back River Sewage Works near Wilmington, Del., the Baldwin-Southwark Plant of the Baldwin Locomotive Works at Chester, Pa., the Sun Shipbuilding and Dry Dock Company's plant at Chester, and the Fabricating Plant of the Bethlehem Steel Company at Pottstown, Pa.

Arrangements for the trip were made with the assistance of G. J. Requardt '09 of Whitman, Requardt, and Smith, Baltimore consulting engineers; O. V. Kruse, '09, general sales manager of the Baldwin-Southwark Co.; and John G. Dew '25, president of the Sun Shipbuilding and Dry Dock Company.

END OF THE QUADRANGLE

E.E. FACULTY MEMBER TESTIFIES

Professor W. C. Ballard, Jr., of the School of Electrical Engineering, Cornell University, went to Washington the week of April 23 to appear before the Supreme Court of the District of Columbia as an expert witness in an important patent suit. The suit, in which several moving picture and radio companies were vitally interested, involved basic patents for sound reproduction in talking movies. Professor Ballard was retained as one of the country's leading authorities on photo-electric cells and their application to processes of sound reproduction.

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MAXWELL M. UPSON SPEAKS

"Visibility unlimited," a phrase taken from Ann Lindberg's recent book, is Maxwell M. Upson's description of clear thinking. Addressing senior mechanical and electrical engineers at Cornell, Friday, April 28, the Cornell trustee and president of the Raymond Concrete Pile Company, stressed the necessity of disregarding habits and traditions of thought and driving straight to the heart of each specific problem.

"Pioneering is more difficult for the engineer than for almost any other professional man," he said, "because the engineer can't afford to make mistakes. If he puts up a structure that falls or builds a bridge that collapses, the mistake follows him all the rest of his life and may completely ruin his professional career.

"Nevertheless, pioneering is vitally needed in engineering and a great deal of it is being done. Although it takes great courage for an individual to pioneer, many of the great modern projects are being handled by groups. If a board of six or eight engineers decides that a new method for accomplishing a specific problem should be adopted, the individual risk both in prestige and in money is less, and there is also greater chance of ultimate success." Mr. Upson, who is a graduate of the College of Engineering at Cornell in the class of 1899, went on to give examples, illustrated by lantern slides of various projects in which engineers had shattered precedents and had achieved almost unbelievable success.

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A.I.E.E. ELECTS

New officers of the Cornell Student Branch of the American Institute of Electrical Engineers, all of the class of 1940, were elected as follows: Crawford G. Adams, chairman; Edward L. Clayton, vice chairman; and Joseph C. Marshall, secretary-treasurer.

At the meeting held Friday, April 28, R. B. Roe '39 gave a talk and demonstration on "Instrument Flying" and movies of tarpoon fishing were shown.

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NON-RESIDENT LECTURES

Colored moving pictures and lantern slides of modern boilers and related apparatus, showing combustion within boiler furnaces and other unusual shots of such equipment in operation, accompanied the lecture on Friday, April 20, of Otto de Lorenzi on "High Pressure Steam Generating Units" in Room 2 West Sibley.

The lecturer, who is now assistant general sales manager of the Combustion Engineering Co., was graduated from the College of Engineering in 1916.

C.E. SCHOOL ELECTS OFFICERS

For the first time in many years the classes of the School of Civil Engineering recently elected officers. The president and secretary of each class will serve on a general board for the school.

Gene Hintgen was elected president of the class of '39 and president of the board. Carl Harger is the secretary of the class of '39 and also of the board. The other officers are: William Gay, president, and Paul Swatek, secretary of the class of '40; Paul Simmons, president, and Warren Lansing, secretary of the class of '41; Paul Leighton, president, and William Young, secretary of the class of '42.

The main purpose of the board is to promote fellowship among the classes in the School of Civil Engineering and to establish a system of student government.

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PROFESSOR SWITZER MENTIONED

Professor Frederick G. Switzer of the College of Engineering, Cornell University, is featured in the May issue of "Who's News in Who's Who," a biographical magazine published by "Who's Who in America." His is one of the new names to be listed in the forthcoming issue of the book, singled out for special mention.

Under a photograph of Professor Switzer operating a piece of equipment in the photo-elastic laboratory of the Sibley School of Mechanical Engineering, the magazine has this caption: "Frederick G. Switzer—with Cornell engineering faculty since 1916, now professor and head of department of mechanics and hydraulic engineering—started as test engineer with General Electric—vice-chairman of hydraulic division of American Society of Mechanical Engineers—author of two books."

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A.S.M.E.

K. V. Wheeler, vice-president and plant manager of the Lebanon Steel Foundry, Lebanon, Pa., delivered a lecture on "Cast Steel and Steel Castings" Tuesday, May 9, in the Baker Laboratory lecture room. The lecture was sponsored by the Student Branch of the American Society of Mechanical Engineers. Mr. Wheeler has made great contributions to the art of making steel castings and has been most influential in their ever-widening use today. His talk covered the physical characteristics obtainable in cast steel, the application of steel castings, and design and foundry problems. He showed how design factors influence the castings and require special consideration in many of the phases of operation, which must be gone through in producing an intricate pressure casting. The talk was illustrated.

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PROFESSOR BANGS SPEAKS

Professor John R. Bangs, Jr., of the College of Engineering, Cornell University, addressed the Rotary Club of Rochester Tuesday, May 2. His subject was "Creative Imagination in Business and Industry." This is one of a series of popular talks that Professor Bangs has given in many parts of the country.

(*Continued on page* 16)

PERSONALITIES

(*Continued from page* 12)

WILLIAM HARRY JOHNS '39, A.E.

One of the most important things that he has gotten out of college, according to Harry, is the contact he has had with members of the faculty and coaching staffs. While many Cornellians value highly the friendships they have made during their school years with men of their own and other classes, few realize the human qualities and understanding of the men who direct our efforts here.

Activities: Freshman Football, Freshman Track, Freshman Rifle Team, Varsity Football, Varsity Track, Editor in-Chief the CORNELL ENGINEER, Kappa Tau Chi, Spiked Shoe.

THOMAS L. SNOWDON '39, E.E.

Boating near Niagara Falls in another of his favorite pastimes. Once he was stranded two miles above the Falls in a rapid current with a boat half full of water. The outboard had become stubborn and it was only after he had "cussed a-plenty and cranked even more" that she finally caught.

Tom loves to travel. During the summer of his freshman year he explored the South. The following summer found him out on the West Coast enroute to Alaska. Last summer he assisted an inventor of soda-fountain equipment and performed tasks ranging from draftsman to machinist.

We are not surprised that Tom intends to enter the automotive industry, for his interest in all technical subjects prove him well qualified. THE CORNELL ENGINEER is proud to have had him as its Advertising Manager and should like to take this opportunity to extend to him its best wishes for a brilliant future.

ALBERT TRUMAN MAYLE, JR. '39, E.E.

associations you make are a very important part of your college life. "Procrastination" says "Bud", "is the greatest evil. It keeps you from doing a lot of things you might do otherwise." This never bothered "Bud" as evidenced by his list of activities and his high scholastic standing, and he has happily been able to combine studying and pleasure to get the most from both.

"Bud" hails from Niagara Falls, New York, and although there he has all the power he probably needs, we say more "power" to you "Bud" Mayle.

Activities: THE CORNELL ENGINEER 2, 3, and 4; Eta Kappa Nu; Cornell Amateur Radio Association; Engineering Show.

JOHN GEORGE TAMMEN '39, C.E.

fraternity and cooperating in its running, participating in extra-curricular activities, and learning engineering from men prominent in the field have done the most for him at Cornell. He is starting a collection of books on architecture and bridges which he hopes will expand with time. His only criticism of the Civil Engineering course is the lack of a non-resident lecture course. The fact that he has a job with the American Bridge Company proves that his college years have been a success.

Activities: Freshman 150 Crew, Varsity 150 Crew, Crew Club, Freshman Advisory Committee, The CORNELL ENGINEER Board, Managing Editor 4, A.S.C.E., Pyramid, Chi Epsilon, Tau Beta Pi, Pi Kappa Alpha.

WITH THE ENGINEERS

(*Continued from page* 15)

PHOTOELASTIC EXHIBIT

A special exhibit of the latest models of polaroscopes, the apparatus used in making photoelastic investigations, was open all day Saturday in the M. E. Library, Sibley Dome, Cornell University. The Bausch and Lomb Optical Company of Rochester, which supplied the exhibit, sent Charles C. Nitchie '05 of the company's technical staff to explain the operation of the equipment to all interested.

The exhibit was a feature of the Ninth Semi-Annual Eastern Photoelasticity Conference which brought more than 100 scientists and engineers to the campus Saturday. Technical sessions were held in the morning beginning at 8 o'clock, and from 3:30 to 4:30 P. M. The time immediately after lunch was used for a business meeting, an inspection tour of the Cornell Photoelastic Laboratories and other equipment, and a coffee hour in Sibley Dome.

Wives of the College of Engineering faculty had prepared a special program for the wives of delegates. There was a tour of the campus and nearby scenic spots at 2 P. M. and tea at the home of Mrs. S. C. Hollister at 4 P. M.

Official campus headquarters was Willard Straight Hall and official residential headquarters were the New Glenwood Hotel. The committee on local arrangements included Professor F. G. Switzer, chairman, C. W. Armstrong, T. R. Cuykendall, H. V. Hawkins, and G. H. Lee.

C. E. BREAKFAST

All alumni of the School of Civil Engineering and their wives and families are invited to the annual Civil Engineering Breakfast on Saturday, June 17. This affair, which has become an established Commencement tradition, will be held in the Recreation Room, Sibley Dome, from 8 to 10:30 A. M.

CORNELL SOCIETY *of* ENGINEERS

"The objects of this Society are to promote the welfare of the College of Engineering at Cornell University, its graduates and former students and to establish a closer relationship between the college and the alumni."

President's Column

Fellow Engineers:

As this is the last opportunity I shall have to address you on this page of the CORNELL ENGINEER, there are several thoughts I should like to leave with you. During the course of the year in the conduct of the Society's affairs, I have had the privilege of meeting many Cornellians and others and discussing with them matters of mutual interest concerning our Society and the College of Engineering.

FURMAN SOUTH, JR.
Vice-President, Pittsburgh Regional

As an organized body of engineering alumni it is natural that our main purpose should be centered in the continuation of the high standing and the up-building of the Chemical, Civil, Electrical, and Mechanical schools at Cornell. Just how can this aim be accomplished most effectively?

In the first place there should be an increase in the active membership of the Society. Steps towards that end have become productive of gratifying results during the past year and it is confidently expected that a greater increase will be shown during the ensuing year. The work of the Membership Committee will continue. It is not an easy task for them to contact individually the many thousand alumni and it will greatly assist the committee if you will renew your membership if you have not already done so by returning the membership notice which is attached to this issue.

Membership in the Society carries with it a subscription to the CORNELL ENGINEER. We can be justly proud of the publication and in discussing the plans for the coming year with Mr. Beach Barrett and other members of the staff I feel sure that the issues to follow will be even better than before. More interest is being shown in the paper by everyone connected with it. Greater space for subject matter is to be provided. To do this there is need for increased subscriptions and more advertising.

President Day informs me that the reorganization of the Engineering College Council will probably take place in June so that with the beginning of the next academic year the council may begin to function effectively again. The retiring president of the society has been designated by the Executive Committee to represent the Society on the Council. Action by the Trustees on this matter will serve a very desirable purpose in making available in a representative body the opinion and experience of those engaged in industry.

Recently I attended the annual meeting of the Yale Engineering Association together with the presidents of the Harvard and Princeton Associations. It marked the twenty-fifth anniversary of the organization of the Yale body and was a delightful occasion. The pattern of their group is much the same as ours. We invited the presidents of those associations to our annual meeting. Perhaps in the future with regional groups of our society we can foster similar exchange of association with these and other like organizations.

Many of you know Dr. C. F. Hirshfeld as a teacher, as an engineer or as a friend. His death occurred on April 19. He long took an active interest in the Society and for many years spoke at least once a year to our members. It was my privilege to know him well and with many others I feel the loss of a most human and kind friend.

In closing this letter may I thank you for your part in promoting the work of the Society during the past year. I have attempted as far as it has been possible to speak with you individually on this page. I feel a spirit of friendship with you in the cause of this great body of engineering alumni and its duty and purpose to Cornell.

Sincerely,
WALKER L. CISLER

NEWS OF ENGINEERING ALUMNI

'95 ME—DAVID B. RUSHMORE is president of the Espanol-Americano Company, 14 Wall Street, New York City.

'06 CE; '09 ME—ROBERT H. KNOWLTON, who has been a director and vice-president in charge of sales and public relations for the Connecticut Light and Power Company, was recently elected executive vice-president of the Company. He has a son, Robert Knowlton, who is a Junior in Mechanical Engineering; lives at 36 Westwood Road, West Hartford, Conn. A. V. S. Lindsley '09 has been elected vice-president in charge of sales for the Company, with offices at 36 Pearl Street, Hartford, Conn. He will move to new offices in Waterbury, Conn., early in June. He is married and lives in Watertown, Conn.

'09 CE—CHARLES CLARK is an engineer with the Altoona Steel and Pipe Supply Company, Altoona, Pa., where his address is 1605 Sharp Ave.

'11 CE—A. MANUEL FOX, United States Tariff Commissioner and vice-chairman of the Committee for Reciprocity Information, was a guest consultant at the fourth annual Harvard-Yale-Princeton Conference on Public Affairs at Princeton April 21-22. The subject of the conference was "Immediate Problems and Policies of the United States Government." Fox attended a similar conference in the same capacity at Princeton four years ago, and last year's at Willard Straight Hall between Cornell, Dartmouth, and Pennsylvania.

'12 CE—CALVIN L. WILSON is auditor and secretary of the Acme Brick Company, Fort Worth, Tex., where he lives at 4066 Mattison Street.

'12—HAROLD P. WOOD is an engineer with the Morgan Construction Company, Koppers Building, Pittsburgh, Pa. He is married, has two children, lives at 160 Inglewood Drive, Mt. Lebanon, Pittsburgh.

'13, '14 CE—WILLIAM E. DICKINSON is a hydraulic engineer with the U. S. Geological Survey, 429 Federal Building, Los Angeles, Cal.

'17 ME—CHANDLER BURPEE is secretary and treasurer of the Spurgeon Hosiery Corporation, 1815 Willard Street, Philadelphia, Pa. He lives at 3116 West Coulter Street, Philadelphia, Pa.

'17 CE—NATHAN DINNERSTEIN is with the Mott Haven Auto Wreckers, Hunts Point and Spofford Avenues, The Bronx. He lives at 1492 Plimpton Avenue, The Bronx.

'20 ME—WILLIAM LITTLEWOOD, vice-president of American Airlines and of the Society of Automotive Engineers, was co-chairman of the S.A.E. National Aeronautical meeting in Washington, D. C., March 16-17.

'21 CE—WALDEMAR POLACK is a construction superintendent; his address, 2100 Creston Avenue, New York City. He writes, "Have just completed construction of a six-story building of eighty-two apartments and ten stores at Broadway and Britton Avenue, Elmhurst, for Joseph Peribinder. Now starting the erection of two six-story buildings, each of sixty apartments, and a one-story, eight-store building at Queens Boulevard and Sixty-third Avenue, Rego Park, for Samuel H. Golding."

'22—FRANCIS W. LAKE is a petroleum engineer; his address, 210 West 7th Street, Los Angeles, Cal. He writes, "Just overhauled my schooner New Moon for the San Francisco Fair. Will take in the New York Worlds Fair and Cornell this fall."

'24 CE—JOSEPH BEVACQUA is president of the Joseph Bevacqua Civil Engineer and Building Construction Co., 1340 Ridge Road, East, Rochester.

'25 CE—HURBERT DAVIDSON formerly with the Blaw-Knox Co. Pittsburgh, Pa. is now with Waddell & Hardesty, Consulting Engineers, 142 Maiden Lane, New York City.

'27 EE; '27 EE—ARTURO E. SALDANA, formerly a power sales engineer with the Puerto Rico Railway Light and Power Company, is now manager of Cia. de Alumbrado Electrico de San Salvador; his address is P. O. Box 186, San Salvador, El Salvador. He has a daughter, Oliva Mercedes Saldana, six years old, and a son, Arturo E. Saldana, Jr., eight months old. He writes, "Dean A. Lyon '27, an engineer with the Anaconda Wire and Cable Company, Hastings-on-Hudson, recently came to San Salvador on a vacation. Aside from the short time that we were together, he spent the greater part of his time on his hobby of climbing and taking pictures of active volcanoes in the vicinity."

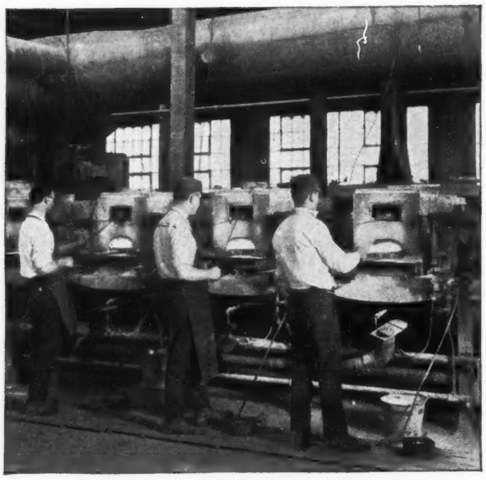
'36, '37 ME—ALBERT G. BEYERLE is a test engineer with the General Electric Company, Schenectady.

'36 ME—LEONARD C. MARSAC is engaged to June E. Peterson. Miss Peterson attended the College of William and Mary. Marsac is in the experimental engineering department of the Singer Manufacturing Company, Elizabethport, N. J.

'37—CE—NORMAN E. SCHLENKER is in the erection department of the Bethlehem Steel Company, Box 205, Portsmouth, Va. He was formerly a junior engineer at the Pottstown works of Bethlehem Steel.

OPTICAL GLASS

(*Continued from page 6*)



—Courtesy of Bausch & Lomb

Moulding Rough Lens Blanks

of waste. The surfaces are polished, the number depending on the number of planes the prism is to be used in. These blocks must be nearly physically perfect—they are tested for striae, strain, and bubbles. Careful manufacture will prevent these defects from setting in. The blocks are then cut into the shapes desired; a square prism can of course be cut into two triangular prisms.

The lens and the prism are used by the engineers so much that they sometimes forget the great care necessary to make optical glass. The surveyor uses a lens in his transit and level; the chemical engineer uses a microscope to analyze certain substances; glass is used universally by engineers and everyone. If this article makes the engineer realize what a marvelous piece of engineering a piece of glass represents, then the article has been successful.

This article has been prepared through the permission of, and with the help of the Bausch and Lomb Company of Rochester, New York, especially Mr. John Forrest.

SHEAR MACHINE

(*Continued from page 9*)

The operation of the shear machine is comparatively simple. The yoke is raised as high as possible, and the lower block centered between the sides of the base. The upper guide block is then screwed to these sides, and the sample is lowered or placed on the upper face, or fins, of the lower block. The upper block is then inserted in the guide and lowered until it rests on the sample. The large ball bearing is next centered and the yoke lowered, applying a small normal load to force the upper fins into the soil, or to consolidate the sample. The dials for measuring horizontal and vertical deflections are then adjusted, and the proving ring is placed in position.

A locking pin is used while the above assembly is adjusted. After the correct normal load (measured by the scale) has been applied by turning a large wheel connected to the jack, the pin is removed and the sample is then ready to shear. The horizontal load is applied at a constant rate by turning the hand wheel and screw slowly and steadily. Simultaneous readings of the three gauges are taken at 15 second or 30 second intervals by the operator and two assistants, until failure occurs. Failure of the sample is indicated by excessive movement or by a dropping off of the load. The sample is then removed and its moisture content determined. The dial readings for load are converted to equivalent loads in pounds from a calibration curve, and the results of the test are plotted up as a curve, as a check on the work. Finally, a series of such tests on the same soil under different normal loads is plotted as a "shear curve" from which is determined the cohesion and angle of internal friction of the soil, as well as the shearing value under any normal load. This information is important to the design or analysis of earth dams, dikes, piling, caissons, tunnels, or for pressure distribution.

Previous types of apparatus have been large and unwieldy, and the sample tested has usually been relatively small. Our device takes a 16 sq. inch sample and, by the addition of adapters, may be used to test smaller undisturbed samples if necessary. Older types of testing machines used a liquid manometer for measuring the horizontal load, but all modern machines now use a proving ring. One distinct advantage of the Cornell apparatus is that the shearing plane is maintained absolutely horizontal, since the device rolls on the four small wheels. Previous types held the upper block less securely, so that a tendency to rotate was noticed when testing. This fault has been entirely eliminated.

HE BROUGHT DEMOCRACY TO INDUSTRY

(Continued from page 3)

This has been one of the most interesting phases of the program.

Of course, suggestion systems are not new. Many companies believe they have satisfactory plans; but an actual check reveals few that are really effective. Suggestion plans fail for two reasons. One is the feeling on the part of employees that those above them will resent a suggested improvement if it in any way seems to criticize the method that may have been set up originally by a superior. The second reason is the fear of many employees that the person above them will take credit for their good idea.

In plants instituting work simplification programs, the plan is not usually introduced until after the "why" questionnaire has made the workers realize that their ideas are wanted, and that foremen, supervisors, department heads, and top management not only will welcome criticism, but will take prompt action to correct things which are wrong.

In the "why" questionnaire the worker is encouraged to submit his ideas in person to his superior. Each foreman or supervisor is expected to answer all the questions submitted to him if possible, or if he cannot do so, to send them to his superior. Questions often go up the line until either a satisfactory answer is given or, if there is no answer, a change is made in the procedure that has been questioned.

Management has been quick to recognize the importance of this new psychological approach and to realize the value of motion pictures as an effective aid in operator training. In some plants the application of the motion picture has been carried to the point where projection booths have been installed in the production areas, and loops of film made available for workers any time they wish to go in and study an operation.

In one plant it was necessary to limit the workers to coming two hours before the shift started, for some of them had been coming three and four hours ahead of time—so great was their interest in this phase of the work. Heated discussions often arose as to just what did constitute the best way of doing a particular operation, and the methods department received many requests for further filming as individual operators perfected new ways that to them seemed better than the one shown in the film. In this manner not only are better methods finally arrived at, but what is equally important those better methods are wholeheartedly and enthusiastically adopted by the workers.

Engineers in the past have too often lost sight of the man in their mad race for technological and economic improvement. This is unfortunate for it has doomed many splendid projects to failure from the start. Not so with Mogensen. To him the worker is the key to the solution of many of our difficulties.

Appropos as a conclusion to these thoughts is the story Henry C. Linck tells in his "Rediscovery of Man:"

A great astronomer once remarked to a friend, "To the astronomer, man is an infinitesmal dot in an infinite universe." "Ah," said the friend, "but man is still the astronomer."

CHARLES M. MANLY

(*Continued from page* 10)

of $50,000 had long been exhausted. Since no further governmental funds were available, the machines and engines were suitably disposed of; and on March 31, 1905, Charles Matthew Manly resigned from the Smithsonian Institute.

Having acquired a store of engineering ideas while working with Dr. Langley, the dark, slim Cornell graduate went from Washington to New York with the avowed purpose of commercializing certain of these ideas. Chief among these projects, and the one for which he is best known in the field of general engineering, is the hydraulic variable-speed power-transmitting mechanism, known as the Manly Drive. Taking out his first patent two years after the turn of the century, Manly was as truly a pioneer in the field of hydraulic equipment as he was in the field of aviation.

From 1906 to 1915, Manly was vice-president and chief engineer of the Manly Drive Co., formed to develop this mechanism technically and commercially. In those days, it was used in operating rolling lift bridges, in experimental passenger cars, and in motor trucks. Sixty of the drives adapted for controlling large guns and turrets, were installed by the Bethlehem Steel Company in the $22,000,000 Argentine battleships built about 1911.

Manly's work in the field of hydraulics was both basic and extensive, as is shown by the fact that one or more of his nearly forty patents on hydraulic devices is often cited against a very large majority of patent applications in this field. But the Manly Drive was ahead of its time. Although sound in its conception and design, the machine-tool art of the first decade could not cope with the fine fits and close limits the Drive required; the high cost of manufacturing did not permit their widespread use in automobiles and manufacturing plants. But Manly had an unshakable faith in hydraulic equipment; his confidence and judgment has been fully vindicated by the commercial success and still rapidly growing rate of application of hydraulic drives.

Aviation still continued to hold much of his interest, and he was rightly considered an expert in the field. At the outbreak of the World War, the German Government attempted to secure his services for the duration of the war. Because his sympathies were so strongly with the Allies, he refused and instead became attached as consulting engineer to the British War Office. Giving up his personal practice and leaving the details of hydraulic development in the hands of trusted employees, he went to Canada as inspector of construction. A pioneering achievement in this connection was his design of the first multi-engine bomber which not only met but surpassed the specifications.

When the United States entered the War, Manly immediately transferred his services to this country, being appointed chief inspection engineer of the Curtiss Company. The spring of 1918 found him in Europe as one of the fourteen American delegates to the International Aircraft Standards Conference. The primary mission of the American delegation was to offer supplies to our European Allies; and at the many conferences held, agreement was sought on standards for the properties and compositions of materials and in the relative proportions of minor parts. Contributing much to the equipment of the air forces by design and inspection work at the Curtiss factory, Manly became assistant general manager of the Curtiss Company at the close of the World War.

Charles Matthews Manly led a full and active life. After his graduation from Cornell, he entered a field unfamiliar to him and explored up to that time only by a few daring and original scientists. With a full realization of the risks involved, he gambled his life in furthering the development of a new instrument of transportation and war. Unselfishly, he gave the world the fruits of his brilliant engineering ideas and unremitting toil. And his private practice of his profession, although less spectacular, was distinguished by both astuteness and ingenuity. On October 15, 1927, death took him at the height of his powers, before the lagging world had accorded him his rightful fame.

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COLLEGE OF ENGINEERING
CORNELL UNIVERSITY
ITHACA, NEW YORK

S. C. HOLLISTER, DEAN OF THE COLLEGE

July 1, 1939 O - 6

National Bureau of Standards
U. S. Department of Commerce
Washington, D. C.

Gentlemen:

M.R

In response to your request of June 29, concerning the CORNELL ENGINEER, I beg to inform you that title pages and indexes to volumes 1, 2, and 3, have not been printed. I assume, therefore, that your file of the publication is complete.

Very truly yours,

Raymond F. Howes

RFH/pat

Raymond F. Howes
Assistant to the Dean

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NATIONAL
BUREAU OF STANDARDS

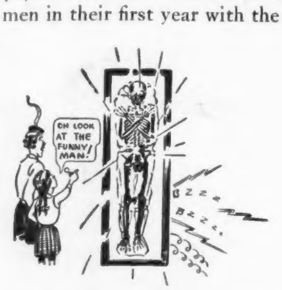
G-E Campus News

IT CUTS SOME ICE

NICODEMUS, the brown-nosed seal, playfully swam up to the North Pole, tripped the circuit-breaker and plunged Santa's workshop into darkness.

Absurd? Not as far as the successful operation of G-E outdoor air-break switches is concerned. These have been placed in a special room in the General Electric Research Laboratory at minus 20 degrees Fahrenheit, sprayed with water, and tested when coated with ice to a thickness of one and a half inches. The powerful leverages shattered the ice as easily as a walrus swallows a fish. In each case the switches opened and closed properly.

This test is just one of the many which G-E equipment must pass. And the observers, who check the operations with pitiless eye, are members of the G-E Test Course—young college men in their first year with the Company.

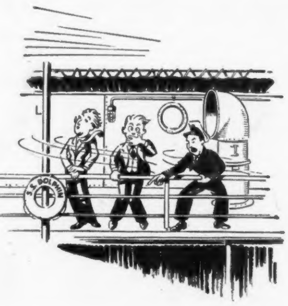


OH! MUMMY...!

A SKELETON in the closet—a white-robed ghost in the attic—even Ichabod Crane's headless horseman—may well feel jealous of Harwa, the Egyptian mummy. For while conservative ancestors content themselves with rolling in their graves in a genteel way, Harwa is floodlighted in a golden glow in full view of the public in the G-E building at the New York World's Fair.

This unusual exhibit is designed, not to frighten women and little children out of their wits but to demonstrate one of the many uses of x-rays. By pressing a button, an x-ray machine is turned on, and an image of Harwa's skeleton appears on a fluorescent screen which moves in front of the mummy. The principle employed is the same as that by which a doctor may fluoroscope a broken bone, except that the entire body of an adult person is viewed.

Harwa lived 2800 years ago, in Egypt. From inscriptions on the coffin lid it is learned that he was overseer of storage houses on the great farming estate of one of the temples of Amen, chief god of the empire. Pathological study of the mummy by means of x-ray indicates that Harwa was probably forty years old at the time of his death. And now, nearly 3000 years later, he is in his portable grave, a citizen of ancient Egypt in the World of Tomorrow.



FLOATING POWER

THE surging waves of a stormy sea are beautiful to an artist, disconcerting to a food-loving passenger, but just another problem to an engineer. Whenever a sleek, ocean liner plows her bow through a heaving swell, her engines feel an added load, and her captain wonders if the fuel will last. So, G-E engineers built an all-electric meter that will accurately measure the power put out by the propeller of any boat, from a tiny tug to a transatlantic greyhound.

The meter is essentially a combination of two electric generators mounted a little distance away from each other on the propeller shaft, and connected to instruments which can be located at any point on the ship. The generators are so mounted that at no load the voltages generated are exactly 180 degrees apart in phase and therefore add to zero.

When a load is placed on the revolving shaft, the torque causes a small angular twist in the shaft; consequently, the two generated voltages no longer add to zero. The resultant voltage is proportional to both the shaft twist and the propeller speed, and hence the meter can be made to read directly in horsepower. The installation can easily be modified to indicate total horsepower-hours and to write an automatic log of the power delivered during the trip.

Among the G-E engineers who developed the device are A. V. Mershon, Pratt Institute '13 and Union College '15, and C. I. Hall, U. of Illinois '10.

NEW YORK WORLD'S FAIR—SEE THE G-E "HOUSE OF MAGIC"—SAN FRANCISCO INTERNATIONAL EXPOSITION

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